OUR ASTRONOMICAL COLUMN

THE VARIABLE STAR R AQUARII.—Harding notified his discovery of variability in this star in 1811, in the first volume of the *Zeitschrift für Astronomie*. The earliest attempt to determine the period appears to be that of Westphal, in the *Zeitschrift für Astronomie*, vol. iv. p. 218; he used Harding's observations between October 20, 1811, and January 19, 1817, which, though not numerous, sufficed to give an approximate value, while they also indicated that the star at times was as bright as 6·7 m., and at others was invisible in Harding's telescope. Westphal's period is 382·5 days. Although the variability of the star has thus been long known, it would seem that few of these objects have been less observed, and it may be recommended to the attention of those who are interested in this branch of astronomy, and whose positions enable them best to command a star at 16° south declination. In vol. vii. of the Bonn observations, Argelander deduces the following formula for the maxima:—

1843, September 4·7 + 388^{d}·011 E.,

which is adopted in Prof. Schönfeld's second catalogue (Manheim, 1875); the maximum of the present year would therefore fall on September 25, and may be well observed. In the same catalogue the degree of brightness at minimum is set down as "11 m (?)." Harding estimated the star 6·7 m. on October 20, 1811, and on January 24, 1812, it was not visible in his telescope, being then below what he called a tenth magnitude, so that observations for determination of the minima should probably be commenced not later than seventy days after the maxima, but it is hardly necessary to remark that in the actual state of our knowledge of the variations of this star, continuous observations through as long a period as its position allows, will possess much interest. The best determination of the place of R Aquarii will be that of the Greenwich Catalogue of 1864, giving for the beginning of the present year—

R.A. 23h. 37m. 30s·35, N.P.D. 105° 57′ 37″·3.

ε INDI.—When may we hope that some southern observer will find opportunity of attacking the parallax of this remarkable star, the large proper motion of which was first pointed out by the late Prof. D'Arrest, and confirmed by Moesta from the Santiago observations of 1856? Mr. Gill, who allows nothing to escape him, during his brief visit to the other hemisphere, wherein Lord Lindsay's heliometer enables him to do an astronomical service, states that he has measured the distance and position-angle of ε Indi relative to five surrounding stars, and hopes "that this may serve as the foundation at some future day of a determination of its parallax and proper motion," but it is obvious that the shortness of his stay at Ascension does not permit of an attempt to measure the amount of parallax—a very interesting undertaking in the case of this star, which, had time allowed, we do not think that Mr. Gill would have hesitated to attempt. And ε Indi is not the only star which holds out prospect of success in parallax investigations in the southern hemisphere.

THE SATELLITES OF MARS.—In the last number of the "Monthly Notices of the Royal Astronomical Society" is a communication from the director of the Observatory at Melbourne, giving the results of a search made for the satellites of Mars, in consequence of a telegram notifying their discovery, and received from Sir George Airy on August 22. At that time, from an accident to the declination movement, the large reflector was not available, but observations with it were commenced on September 26. Mr. Ellery states his search to have been fruitless, except that on one occasion it was believed that one of the satellites was seen. This was on the night of October 16, when Mars having occulted a star of the thirteenth magnitude at 22h. 15m. sidereal time, after its emergence a very faint point was seen half a diameter from Mars s.p.; "this was watched for nearly an hour, when its position indicated a motion with Mars," but the sky becoming cloudy, no measures could be made, and, it is added, "no other signs of satellites have been observed since."

If we use the elements of the exterior satellite employed for the ephemerides which have appeared in this column, and which agree precisely with measures of position-angle made by Mr. A. Common, of Ealing, with his eighteen-inch silver-on-glass reflector on the date in question (October 16), we have the following angles and distances:—

Melbourne Sidereal Time.		Position.		Distance.		Distance from Limb.
h. m.		°		″		″
22 15	...	216·0	...	34·6	...	25·2
23 15	...	196·7	...	27·1	...	17·7
0 15	...	167·6	...	23·5	...	14·1

Therefore, although the satellite would be in the south-preceding quadrant up to about 23h. 45m. sidereal, its distance would be greater than that estimated at Melbourne, and it is doubtful if this satellite was seen.

As regards the inner satellite, it is not practicable from the measures hitherto published to form so close an estimate of the positions as late as October 16, but on calculation from elements which represent sufficiently well the measures to September 20, it would appear that the satellite was in the south-preceding quadrant after about 23h. 30m. sidereal time, and its distance from the limb at that time would be approximately a semi-diameter of the planet. Thus if either satellite were really observed, it was most probably the interior one—which, indeed, we are assured, is intrinsically the brightest. But the want of better success with the great Melbourne reflector would rather imply that however well adapted for delineation of nebulæ and similar purposes, the instrument fails with observations of such objects as the satellites of Mars.

NOTES

WE understand that on the representation of the Professors of the Royal School of Mines and of the Director-General of the Geological Survey as to the want of proper accommodation for geological teaching in the School of Mines in Jermyn Street, the Lords of the Committee of Council on Education have transferred the instruction in that subject to the Science Schools at South Kensington. As Prof. Judd is supplied with a complete collection of specimens for teaching purposes, and as a laboratory is now provided for him, he will be in a position to give that practical instruction which it is so desirable should be within the reach of geological students.

STUDENTS of pleistocene geology will be gratified to learn that the well-known very fine collection of Ilford fossils, formed by the late Dr. Richard Payne Cotton, F.G.S., has been bequeathed to the Museum of Practical Geology, Jermyn Street. The collection contains 246 specimens of vertebrate remains, consisting of bones belonging to species of mammoth, rhinoceros, ox, aurochs, hippopotamus, horse, deer, Irish elk, lion, bear, beaver, water-rat, wolf, and several kinds of birds. A very perfect lower jaw of the beaver (*Castor europæus*), with some well-preserved bones of the *Elephas primigenius*, the *Rhinoceros leptorhinus*, and the *Bos primigenius*, are among the gems of this private collection, which will form a welcome and most valuable addition to the contents of the National Museum of British Fossils—the more so as the series of late tertiary vertebrates in that collection is by no means so large and complete as could be desired. Every one interested in the geology of the metropolitan area is aware that the Cotton collection, together with that made by Sir Antonio Brady, which has lately been acquired by the British Museum, have formed the basis of those interesting researches which have been carried on by several distinguished palæontologists concerning the nature of the vertebrate fauna which inhabited the Thames valley during post-pliocene times. The nation is very fortunate in thus having secured for the use of students in the future both of these remarkably fine collections.

IT is with much regret that we have to record the death, on the 10th inst., of Andrew Murray, F.L.S., the eminent entomologist. In the field of scientific botany and forestry and in aid of our scientific intercourse with foreign countries he has done good service, and in his own special line as a practical entomologist, the Government collection at Bethnal Green stands as a monument of patient labour, as well as profound knowledge of his subject. A keen observer and unflinchingly truthful, the records of his original observations, or his careful compilations, given in his peculiarly terse and condensed style are a valuable legacy. A valued naturalist and assiduous worker he continued at his post till within a few days of his decease, and sunk away quietly and gently after some months of failing health. In private life he was greatly esteemed as a true-hearted friend, unwearied in aiding wherever he could be of assistance, and also for his high intellectual powers.

THE death is announced, on the 7th inst., of Prof. William Stokes, M.D., F.R.S., of Dublin.

ONE of the oldest, best known, and most useful of American naturalists, Dr. J. P. Kirtland, died on December 10. In 1848 Dr. Kirtland received the appointment of zoologist to the Geological Survey of Ohio, the duties of which he discharged with great fidelity, and his publications connected therewith constitute in a measure the bases of subsequent similar investigations in the West. His most prominent work was that in connection with the fishes of Ohio, for the accurate knowledge of which he laid the foundation, establishing and identifying many of the species of Rafinesque, which up to that time had been considered entirely mythical. He described many new species of western fishes, and the discovery of one species of bird of Ohio is due to his zeal.

AT a meeting held last week in Sheffield, a resolution was unanimously passed to invite the British Association to visit that town next year. Committees were appointed, and it was decided to raise a guarantee fund of 2,500*l*.

DR. SCHLIEMANN has been elected an honorary member of the Deutsche anthropologische Gesellschaft. The diploma of membership is a handsome specimen of artistic work, being encircled by allegorical representations of the excavations at Troy and Mycenæ, and bears the signatures of Virchow, Kollmann, Fraas, Schaafhausen, and Weismann.

THE new New York Natural History Museum was opened by President Hayes on the 22nd ult. The museum is in Manhattan Square, on a plot of land opposite Central Park, and the plan of the entire structure contemplates a colossal enterprise, which cannot be completed within the present century. It consists of buildings arranged in a parallelogram, of 850 by 650 feet, and of two lines of buildings which divide the interior space at right angles, thus forming four equal courts. At the centre of each side of the parallelogram, and at its four angles, lofty towers will be erected. At the intersection of the cross in the centre of the parallelogram, a dome is designed to cover a space of 120 feet diameter. The portion of this great structure which is now completed is a four-story building with a double attic; it has a length of 200 feet; it will form the southern one of the arms of the interior cross. The walls are three feet thick at the top. The whole building is of brick, and is regarded as strictly fireproof. The city has appropriated $700,000 for it, besides giving the land.

MR. STANLEY will probably arrive in England this week. He has been received with enthusiasm at Rome, Marseilles, and Paris. The Chamber of Commerce and the Geographical Society of Marseilles presented Mr. Stanley with medals. No doubt our own Geographical Society will take the lead in the warm reception which will certainly be accorded in this country to one of the foremost of explorers.

THE Commission for reorganising the Observatory of Paris has ended its sittings, as we have already reported. The commissioners recommend no change in the present organisation of the International Meteorological Office; but, taking into consideration the actual wants of meteorology, it has advised the Minister of Public Instruction to appoint a Meteorological Commission, in order to suggest any measures which might be likely to promote the interests of meteorology at large, without interfering with the working of telegraphic weather forecasts sent by the International Office to the sea-ports and more than 1,200 parishes all over France.

THE Scientific Association of France, created by M. Leverrier, after having elected M. Milne-Edwards for its president, has decided upon organising a series of lectures at the Sorbonne, to describe important new inventions and discoveries. The first meeting will soon take place, when M. Cailletet's experiments will be exhibited and explained by M. Henri St Claire Deville. M. Dumas will also deliver an address summarising the history of the Association and reviewing the services rendered by it to science. It is stated that M. Dumas will propose to the Association to initiate a subscription for erecting a monument to the great astronomer who founded it.

IN several cities of Holland committees have been formed with a view to collect subscriptions to defray the expenses of the proposed expedition to the Arctic regions, to which we referred some time since.

MACMILLAN and Co. are about to publish "A Monograph on the Development of Elasmobranch Fishes," by Mr. F. M. Balfour, M.A., Fellow and Lecturer of Trinity College, Cambridge. The work is divided into twelve chapters, and contains the results of much original research on the part of the author, who, on certain points, as on the spinal and cranial nerves, advances views which are a modification of those previously accepted.

IT is announced that the *American Naturalist*, which has had so long and useful a career in Salem and Boston, will hereafter be published in Philadelphia by Messrs. M'Calla and Stavely, under the editorship of Dr. A. S. Packard and Prof. E. D. Cope.

REPORTS from the Island of Sylt, on the west coast of Schleswig-Holstein, state that the storm-flood, which caused such serious damage along the Continental shores of the German Ocean last autumn, has laid bare some remains of the village of Eidum, which perished in the year 1436 by the sea suddenly breaking over it and covering it up. Stone foundations of former dwellings, garden-walls, and wooden remains of various kinds are now seen there, also numerous well-openings, built of massive pieces of dried and baked peat. It is also stated that numerous old coins and utensils have been found there, as well as a well-preserved, carved, and engraved metal bracelet.

RECENT excavations made at Trèves, in the so-called Roman imperial palace, have yielded rich results in Roman antiquities.

ON December 26, at 8 A.M., two meteorolites fell near the village of Höhr (in the Prussian province of Hessen Nassau), close to the high road leading from Neuwied to Coblenz. It is stated that the noise caused by the fall was very characteristic.

THREE earthquakes were observed at Kirlibaba, in the Bukowina, on December 28 and 30 respectively. A fourth phenomenon of this nature was felt at Innsbruck, in the Tyrol, on the 3rd inst., at 8.46 P.M.

BERLIN is listening to an interesting series of lectures delivered under the auspices of the Society for African Exploration. On the programme we notice Dr. Nachtigal, "Ancient Darfour;" Dr. Güssfeldt, "The Arabian Desert;" Dr. Hildebrandt, "Pictures from Equatorial Africa," Prof. Hartmann; "Fauna of the Swedish Islands," &c.

THE two African Societies at Berlin, which have hitherto existed independently of one another, have now finally resolved to unite into a single society.

WE have received the first number of *The Midland Naturalist*, the journal of the associated societies and clubs of the Midland counties, the union of which we referred to some time since. It is a neat and well-printed journal, containing seven good papers, besides miscellaneous matter. Besides the opening address, explaining the formation and objects of the Union, there are papers on abnormal ferns, by Mr. E. J. Lowe, F.R.S.; on an improved aneroid, by Mr. W. J. Harrison, F.G.S.; on the marine zoology of Arran, by Mr. W. J. Hughes (giving the results of an excursion by the Birmingham Natural History Society last summer); Lepidoptera in the Midland Counties, by the Rev. C. F. Thornewill; Entomostraca, by Mr. Edwin Smith; and a paper on some new features in the geology of East Nottingham, by Mr. J. Shipman. This is a very good start, and we hope *The Midland Naturalist* will fill a useful place in our scientific literature. Hardwicke and Bogue are the London publishers.

REPORTS from the Bernese Alps state that the amount of snow fallen during the present month is much greater than has been experienced for a number of years.

THE wolves in Eastern France have become unusually bold during this winter, and reports are constantly received of their depredations in various parts of the country. In one instance a letter-carrier was driven back by them from his regular route.

AN interesting experiment was lately carried out in the neighbourhood of Emmendingen, on the River Danube, to show its subterranean connection with the valley of the Rhine. The river is separated here by a range of Jura limestone from the district drained by the Rhine, and it has long been suspected that the Aach, which has its source in this range and flows into Lake Constance, was really supplied by the Danube. In order to solve the problem, recourse was had to fluorescin, the phthalein of resorcin, a compound which yields with alkalies magnificent green fluorescent solutions capable of imparting this property to enormous masses of water. A solution of this substance was introduced into the Rhine at Emmendingen, and two and a half days later the bright green fluorescence was visible in the Aach, the source of which is about five miles distant, and lasted for thirty-six hours. This experiment shows most decisively that the Upper Danube shares its water between the Black Sea and the North Sea, and affords a most interesting explanation of the close similarity in the finny inhabitants of the two great European rivers.

WE notice the appearance, in Paris, of a French translation of the "Organic Chemistry" of Prof. Fittig, of Strassburg. This work, which in its present form is the tenth edition of the text-book originally issued by Prof. Wöhler, has long been a favourite with the German chemist on account of the scrupulous care and fidelity which have been exercised in preparing each successive edition. An English translation was prepared a short time since by Prof. Remsen, of Johns Hopkins University, formerly one of Fittig's assistants, the circulation of which is confined, however, chiefly to America.

ARRANGEMENTS are being made for the holding of an International Exhibition at Sydney in 1879, under the auspices of the Agricultural Society of New South Wales. It is anticipated that many of the articles shown at the coming Paris Exhibition will be trans-shipped to Sydney.

A propos of the remarkable relation established by Dr. Kerr, a short time ago, between light and electricity, an interesting experiment has been made by Mr. J. Mackenzie, in Berlin, at the instance of Prof. Helmholtz (*Pogg. Ann.*, No. 11). A glass plate, 161 mm. long, 12 mm. thick, and with tin foil on its opposite sides, from which proceeded copper wires to a Ruhmkorff coil (with six Bunsen elements), or a Holtz machine, and to earth, was supported and covered with larger glass plates, and placed between two Nicols, as in Dr. Kerr's experiment, the light-source being a lamp. The electric action gave no perceptible increase of brightness, nor was any such obtained when polarised sunlight was used to give greater sensibility, and a leaf of mica thick enough to give the violet colour was interposed between the glass plate and the analyser. Experiments with oil of turpentine likewise gave negative results. (The high sensibility of the polariscope is demonstrated by distinct experiments.) It is therefore concluded that the phenomenon observed by Dr. Kerr is not produced by electric tension itself, but possibly in a secondary manner, through the heating thus caused. Confirmation of this is found in the fact that in Dr. Kerr's experiments it was only after about thirty seconds from closure of the circuit that the action reached its maximum; it also disappeared slowly.

IN a paper in the *Bulletin* of the Belgian Academy of Sciences (Nos. 9 and 10), Prof. Van der Mensbrugghe discusses the causes of the seemingly spontaneous movements of bubbles of air in levels and of vaporous bubbles in the microscopical cavities of minerals, these researches being part of those into the tension of surfaces of liquids. Prof. Mensbrugghe explains these movements, as Mr. Hartley also does, by changes of tension in the surfaces of liquids produced by changes of temperature; when the temperature of the liquid at one end of the bulb becomes, for some reason, higher or lower than at the other end, however small the difference, the tension of the surface decreases at the warmer end, and the bubble moves towards it. But, a thin film of water remaining on the glass, the surface of the liquid is enlarged at the warmer end, and diminished at the opposite end, and this, according to experiments of the author, lowers the temperature and increases the tension at that end; so that if the temperature now ceases to rise the motion of the bubble is not only stopped, but the bubble also returns backwards. Thus each displacement of the bubble immediately gives rise to such forces as tend to produce a motion in an opposite direction; and the variations of tension produce the more obvious motions the smaller the masses of liquid in which the bubble is swimming. The same explanation may be applied also to the movements of bubbles in microscopical cavities of minerals filled with liquids. In that case, the bubble being produced by the vapours of the liquid, its movements are yet more rapid, as every change of temperature is followed by further evaporation of the liquid, or by condensation, both which alter the dimensions of the surfaces of the liquid and their tension. The author supposes also that the Brownian motions of powders suspended in liquids may be explained in the same way, and that those powders which absorb most gas will best display this kind of motion.

PROF. EMILIO CORNALIA, an eminent naturalist and Director of the Museum of Natural History at Milan, has been decorated by the Emperor of Russia with the order of St. Ann for his efficient co-operation in the foundation of the institute for "Bachicoltura" at Moscow and Tashkend.

THE scientific expedition to Lake Lob-Nor, sent out by the St. Petersburg Geographical Society, under command of Col. Prjewalski, and to which we have already referred, has yielded most interesting results in every direction and is of particular importance with regard to the exploration of Kashgar. The new details obtained in reference to Lake Lob-Nor are remarkable. The expedition continued its way from Korla, following the course of the Tarim River down to its confluence with the Rokala Darja. On their way to the Lob-Nor the travellers passed the ruins of three cities. Lake Lob-Nor is of a marshy nature; its length is some 100 kilometres, by only 20 kilometres breadth. Col. Prjewalski explored the western and southern shores, and through the current of the Tarim River reached the middle of the lake. There the shallowness of the water and impenetrable vegetation prevented further progress; almost the whole surface of the lake is thickly covered with reedy vegetation. The inhabitants of the Kara Kurchintz district, on the shores of Lake Lob-Nor, are on the lowest step of civilisation. They live along the shores as well as on islands in the lake, in miserable huts constructed of reeds and branches twisted together. The whole of their possessions are their clothes, which barely cover their nakedness and are made of the fibres of a kind of lake weed, their nets, and their canoes, which are hollow trunks of trees. Metal objects, such as knives, hatchets, &c., are extremely rare among them. Col. Prjewalski, besides his ethnographical results, has collected rich materials for ornithological investigations. He reports that it is impossible to conceive the enormous number of migratory birds which, on their journey from southern countries to the north, or *vice versâ*, select Lake Lob-Nor as a halting place. At present the Russian traveller has wended his way southward and is engaged in the exploration of Tibet.

IN an interesting paper, published by M. Ph. Plantamour in the December number of the *Archives des Sciences Physiques et Naturelles* (Geneva), regarding the earthquake experienced in the immediate neighbourhood of the Lake of Geneva on October 8 last, the author proves most conclusively that the phenomena known under the name of "Seiches," and consisting in occasional and sudden alterations in the level of the lake, have nothing whatever to do with upheavals or depressions in the bed of the lake. During the earthquake referred to, not the least movement of the surface was perceptible, and had an alteration of only one millimetre taken place in the level, the instruments employed by MM. Plantamour and Forel, which continually register these alterations, would have most certainly shown them. The explanation of these "Seiches," therefore, is still a matter of considerable uncertainty, and it even remains to be seen whether barometrical pressure has any influence upon them or not.

TWO enterprising men in Paris, a merchant and a doctor of medicine, whose names will be surely blessed by future generations, have made the valuable discovery that the different elements contained in sea-water are infallible preservatives against all possible diseases, and at the same time are never-failing remedies against existing illnesses. These two philanthropists have therefore not only issued a seductive prospectus and widely circulated it in France and abroad, but have also prepared a large quantity of hygienic products, such as bread, biscuits, dry cakes of all descriptions, liqueurs, &c., which are all prepared with sea-water, and are endowed with the most marvellous healing properties. In the prospectus it is stated distinctly that the use of these preparations renders all other medicines or medical treatment unnecessary. There is only one little point which requires explanation. The "inventors" state that their preparations are made with distilled sea-water; we would ask them what becomes of the mineral and organic matter contained in sea-water during this distillation? But *mundus vult decipi!*

THE additions to the Zoological Society's Gardens during the past week include a White-handed Gibbon (*Hylobates lar*) from the Malay Peninsula, a Brown Monkey (*Macacus arctoides*) from Burmah, presented by Mr. W. H. Newman; two Black Francolins (*Francolinus vulgaris*) from India, a Chukar Partridge (*Caccabis chukar*) from North-West India, presented by Major Newton Pauli; four Common Marmosets (*Hapale jacchus*) from Brazil, deposited; two Rough Terrapins (*Clemmys punctularia*), a Scorpion Mud Tortoise (*Cinosternon scorpoides*) from Trinidad, purchased.

CERTAIN MOVEMENTS OF RADIOMETERS[1]

THIS morning (Dec. 20) I received from Mr. Crookes an account of the behaviour of a kind of radiometer which he was so good as to construct at my suggestion. The consideration of an experiment mentioned in a paper of his presented to the Royal Society, which will shortly be read, and which he has kindly permitted me to refer to, suggested to me the desirability of investigating the effect of mere roughness of surface, all other circumstances being alike, and the disc of the radiometer being metallic, so that the two faces may be regarded as practically at the same temperature. Mr. Crookes's experiment, above referred to, led me to suspect that mere roughness might increase the efficiency of a surface, and I suggested to him some experiments with heated glass shades, or with a hot poker presented to the radiometer, the bulb being covered with a cool tumbler to defend it from being heated by the rays easily absorbed by glass. The result in every case answered my expectation; and it may be stated shortly that the law of the motion is that when the fly is hotter than the bulb the rough surface is repelled, or, say, the motion is positive; when cooler, negative.

I subjoin Mr. Crookes's memorandum of the results of experiment:—

"*Aluminium Radiometer* (1326), *one side of the vanes being ruled closely with a sharp knife.*

"1. Exposed to standard candle three inches off. Continuous *positive* rotation (ruled side repelled) at rate of 3¼ revolutions a minute.

"2. Exposed to non-luminous flame of a Bunsen burner three inches off. Continuous *positive* rotation at the rate of 7½ turns a minute.

"3. The Bunsen burner removed. The positive rotation gradually diminished till it stopped. No negative rotation.

"4. The bulb heated with Bunsen burner. Good *negative* rotation; then stopped, and rotated *positively* till quite cold.

"5. Bulb covered with a cold glass shade, and a large red-hot ring applied round equatorially. *Positive* rotation, but not very strong.

"6. On removing the shade and ring the positive movement soon comes to rest.

"7. Covered with a hot glass shade, *negative* rotation, with *positive* rotation on cooling (the same as 4).

"8. Plunged into hot water. *Negative* rotation.

"9. Removed from the hot water, and immediately plunged into cold. *Positive* rotation."

Results nearly identical were obtained with another radiometer described as "silver radiometer (1327), one side coated with finely divided silver, electro-deposited."

We must accordingly recognise three distinct conditions under which motion may be obtained in a radiometer, namely, (1) difference of temperature of the two faces, as in a pith radiometer, coated on one face with lampblack; (2) more favourable presentation of one face than the other, as in a radiometer with curved disks; (3) roughness of surface on one face (if this be really different from 2). These three conditions may be variously combined so as to assist or oppose each other, as the case may be, in producing motion.

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[1] Paper read at the Royal Society, December 20, by Prof. G. C. Stokes, Sec. R.S. Continued from p. 175.